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Factors influencing Prevalence of MDR-TB among TB patients admitted to TB ward at St. Kizito hospital maternity, Karamoja sub region

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ABSTRACT

The increasing incidence of multidrug-resistant tuberculosis (MDR-TB) poses a significant threat to global TB eradication efforts. The rapid spread of MDR-TB has garnered global concern. This study aimed to identify factors contributing to the high prevalence of MDR-TB among TB patients at St. Kizito hospital maternity, located in the Napak District of the Karamoja sub-region. A hospital-based descriptive cross-sectional study was conducted from August 2022 to March 2023, involving tuberculosis patients receiving care and health workers at St. Kizito Hospital maternity. Data were collected using interviewer-administered questionnaires. A sample size of 55 respondents was targeted. Data analysis was performed using SPSS version 17. The prevalence and associated factors of MDR-TB were computed using bivariate and multivariate statistical analyses. Variables with p-values <0.05 were considered statistically significant at the multivariate level. Informed consent was obtained prior to enrollment, participation was voluntary, and privacy and confidentiality were maintained throughout the study. A total of 50 participants completed the study, yielding a response rate of 90.9%. The majority of respondents were male (35, 70%) and aged between 50–56 years (40, 80%). The prevalence of MDR-TB was 14% (7 patients). Among the 7 MDR-TB cases, 4 patients (57.1%) had HIV comorbidity, 1 (14.3%) had hepatitis B, 1 (14.3%) had cancer, and 1 (14.3%) had asthma. Multivariate analysis at a 95% confidence interval revealed significant associations with MDR-TB. Factors included age below 50 years (aOR = 14.16, p-value = 0.001), positive HIV status (aOR = 4.39, p-value = 0.034), a history of previous TB treatment (aOR = 7.16, p-value = 0.001), lack of formal education (aOR = 2.51, p-value = 0.017), and experiencing TB symptoms for over one year. The study also found that the facility had a well-organized laboratory network for MDR-TB case detection. However, challenges such as inadequate Drug Susceptibility Testing (DST), inconsistent infection prevention and control measures, delays in seeking medical treatment, and insufficient financing of MDR-TB-related activities were highlighted.

Keywords: Multidrug-resistant tuberculosis (MDR-TB), Prevalence and risk factors, HIV comorbidity, Drug Susceptibility Testing (DST), Karamoja sub-region

INTRODUCTION

Tuberculosis (TB) remains a significant global health challenge, particularly due to the emergence of multidrug-resistant TB (MDR-TB) [1]. While TB incidence has declined in recent decades, MDR-TB poses a critical obstacle to achieving the World Health Organization's (WHO) 2035 targets for TB elimination. MDR-TB complicates TB control efforts with its expensive, prolonged, and often toxic treatment regimens, disproportionately affecting developing nations [2,3]. Globally, an estimated 4.1% of new TB cases and 19% of previously treated cases exhibit MDR or rifampicin-resistant TB (MDR/RR-TB). In 2016, only 153,000 of the 600,000 individuals with MDR-TB were detected, with 240,000 deaths attributed to the disease [4,5]. Additionally, 8,000 cases of extensively drug-resistant TB (XDR-TB) were reported across 123 countries in 2016, with an estimated 6.2% of MDR-TB cases progressing to XDR-TB [6]. The global burden of TB remains stark. In 2017, there were 133 TB cases per 100,000 population, with Asia accounting for 62% and Africa for 25% of cases. TB claimed 1.6 million lives, making it the tenth leading cause of death worldwide and the leading cause of death from infectious diseases since 2012, surpassing HIV/AIDS. Among these cases, 558,000 were MDR/RR-TB, resulting in 230,000 deaths [7,8]. MDR-TB is particularly prevalent in Eastern Europe and Central Asia. In 2012, 3.6% of new cases and 20.2% of previously treated cases globally were

MDR-TB, with India, China, and the Russian Federation accounting for nearly half of the 450,000 reported cases [9]. In sub-Saharan Africa, MDR-TB poses unique challenges. A study in Tigray, Northern Ethiopia, reported an MDR-TB prevalence of 18.5% among presumptive patients from 2015 to 2016 [10]. Globally, 480,000 new MDR-TB cases were reported in 2014, resulting in 190,000 deaths, primarily in developing countries [11]. In Africa, an estimated 93,000 MDR-TB cases occurred in 2016, yet only 30% were diagnosed, and only 59% of treated patients achieved successful outcomes [12,6]. In Uganda, TB remains a significant public health concern. The 2015 National TB Prevalence Survey indicated an incidence of 234 cases per 100,000 population and a prevalence of 253 cases per 100,000 population, with 24% of TB patients co-infected with HIV. TB-related mortality (excluding HIV co-infected cases) was estimated at 12 deaths per 100,000 population in 2014. Annually, Uganda records over 1,040 estimated MDR-TB cases, yet only 200 are detected [13]. A 2018 study at Mulago Hospital reported an MDR-TB prevalence of 1.69%, highlighting the persistent threat despite relatively low prevalence rates [14]. In Zimbabwe, a 2015-2016 survey revealed rifampicin-resistant TB (RR-TB) prevalence rates of 4.0% among new patients and 14.2% among retreatment patients, with MDR-TB prevalence at 2.0% and 6.4%, respectively [15]. MDR-TB treatment in sub-Saharan Africa is particularly challenging due to the high costs and prolonged regimens required for second-line drugs. These treatments often consume more than half of national TB control budgets, straining resources in low-income countries [13]. While Uganda has made progress in reducing notified TB cases, MDR-TB remains a critical issue. Although Uganda met the Millennium Development Goal targets of halving TB incidence, prevalence, and mortality from 1990 levels by 2015, case detection rates still fall short of WHO targets [16]. In northeastern Uganda, the Karamoja region faces unique barriers to TB and MDR-TB control. The region's political instability, nomadic lifestyle, and marginalization from development initiatives have led to inadequate health infrastructure and limited access to care. Karamoja's TB case detection rates are the lowest in Uganda, resulting in increased transmission and mortality. In 2018, CUAMM reported 45 new MDR-TB cases in Karamoja over 24 months, but data on MDR-TB prevalence in the region remains limited. Incomplete surveillance and reporting systems fail to capture patients who self-medicate, use traditional healers, or seek private care. MDR-TB diagnosis in Uganda highlights significant regional disparities. In Karamoja, GeneXpert machines reported MDR-TB positivity rates of 11% to 14%, compared to 4.5% to 7.0% in the Mbarara Region. These data gaps and limited information on contributing factors hinder efforts to estimate MDR-TB prevalence accurately.

METHODOLOGY

Study design

A descriptive facility-based cross-sectional study using both qualitative and quantitative approaches was used. A cross-sectional study design was chosen because it enables the researcher to conduct data collection relatively quickly, within a fixed period, and at a lower cost. In addition, the findings can be used to make conclusions about the entire target population.

Study area

The study was conducted at SKHM, which is one of the MDR-TB treatment centers in the Karamoja sub-region.

Study population

The study population consisted of all TB patients admitted to the TB ward during the course of the study.

Inclusion criteria

The study included TB patients admitted to the TB ward during the course of the study who consented to participate.

Exclusion criteria

TB patients who declined to provide consent or were clinically unstable to participate in the study were excluded.

Sample size determination

Sample size was calculated using Kish Leslie formula:

I.e. $N=\frac{Z^2P(1-P)}{E^2}$

Where **N** is the desired sample size

Z is the standard normal deviation taken as 1.96 at a confidence interval of 95%.

P is the prevalence of MDR TB cases among previously –treated TB cases. National MDR-TB prevalence among re-treatment cases 4% [17]

E is the degree of accuracy= 0.052.

(1-P) which is the population without the desired characteristics = (1-0.120) =0.880

$N=\frac{1.96^2\times0.04\times0.96}{0.052^2}$

$N = 55$

Therefore 55 TB patients were a representative sample to take part in the study. Also, 2 health workers working in TB treatment units were interviewed to assess the health system related factors associated with MDR-TB at SKHM.

Sampling procedure

A simple random sampling technique was used to recruit study subjects admitted to the TB ward during the study period, provided they met the inclusion criteria. Two health workers at SKHM (the hospital director and the head of the TB treatment

unit) were purposefully selected for interviews due to their expertise and extensive knowledge of MDR-TB in the facility.

Data collection methods and management

Data was collected using a researcher-administered questionnaire specifically designed to meet the study objectives. This was supplemented by retrospective data from medical records, including clinical evaluations and diagnoses. Collected data was tallied, tabulated, and presented in line with the study objectives.

Data analysis

Data was entered into Microsoft Excel 2010 Professional and analyzed using SPSS version 17.0. The prevalence of MDR-TB was calculated by dividing the total number of MDR-TB patients by the total number of patients enrolled in the study, multiplied by 100. The association between independent and dependent variables was assessed using bivariate and multivariate analytical methods. Bivariate analysis identified variables associated with the dependent variable, with a p-value of ≤0.25 as the cut-off for inclusion in the final logistic regression model. Statistical significance at the multivariate level was defined as a p-value <0.05 at a 95% confidence interval.

Quality control (reliability and validity testing)

Pre-testing of the questionnaire was conducted using a sample of 20 individuals not included in the main study. This ensured the tools were valid, reliable, and capable of meeting the study objectives. Adjustments were made based on feedback from the pre-testing process.

Ethical considerations

Ethical clearance was obtained from Kampala International University-Western Campus, Faculty of Clinical Medicine and Dentistry, through the Institutional Research Ethics Committee (IREC). An introductory letter was presented to the administration of SKHM. Since the study involved accessing patient medical records, additional permission was obtained from the Institutional Review Boards (IRBs) of study sites or directly from the hospital director.

Limitations of the study

Data on factors influencing the prevalence of MDR-TB at SKHM was collected through self-reporting, which may have introduced inaccuracies, as the researcher relied on the information provided by respondents without independent confirmation. The study was limited to patients admitted to the TB treatment units at SKHM. This could result in an underestimation of MDR-TB prevalence, as some MDR-TB patients may remain in the community and were not considered in the study. Additionally, key informant or in-depth interviews may have been more appropriate for assessing health system-related factors associated with MDR-TB in the Karamoja sub-region.

RESULTS

Study profile

The calculated sample size was 55 respondents. However, only 50 participants participated in the study constituting 90.9%. Out of 50 patients who participated in the study. 35 (70%) were males and 15 (30%) were females.

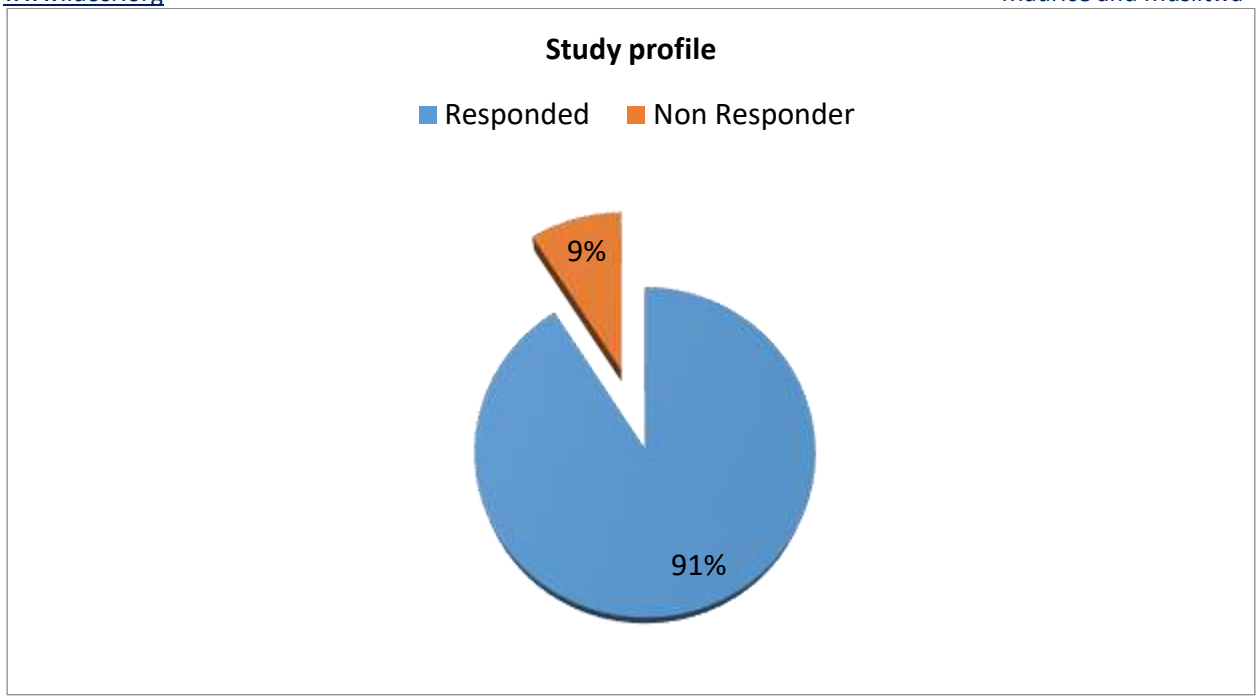

Figure 1: Pie chart showing study profile.

Prevalence of MDR-TB

Out of 50 TB patients sampled in SKHM, 7 respondents had MDR-TB which makes the MDR-TB prevalence to stand at 14%. Out of the 7 MDR-TB cases, 4 (57.1%) patients had HIV comorbidity, 1 (14.3%) patient had hepatitis B, 1 (14.3%) patient had cancer and 1 (14.3%) had asthma. The comorbidities associated with MDR-TB are shown in the figure below.

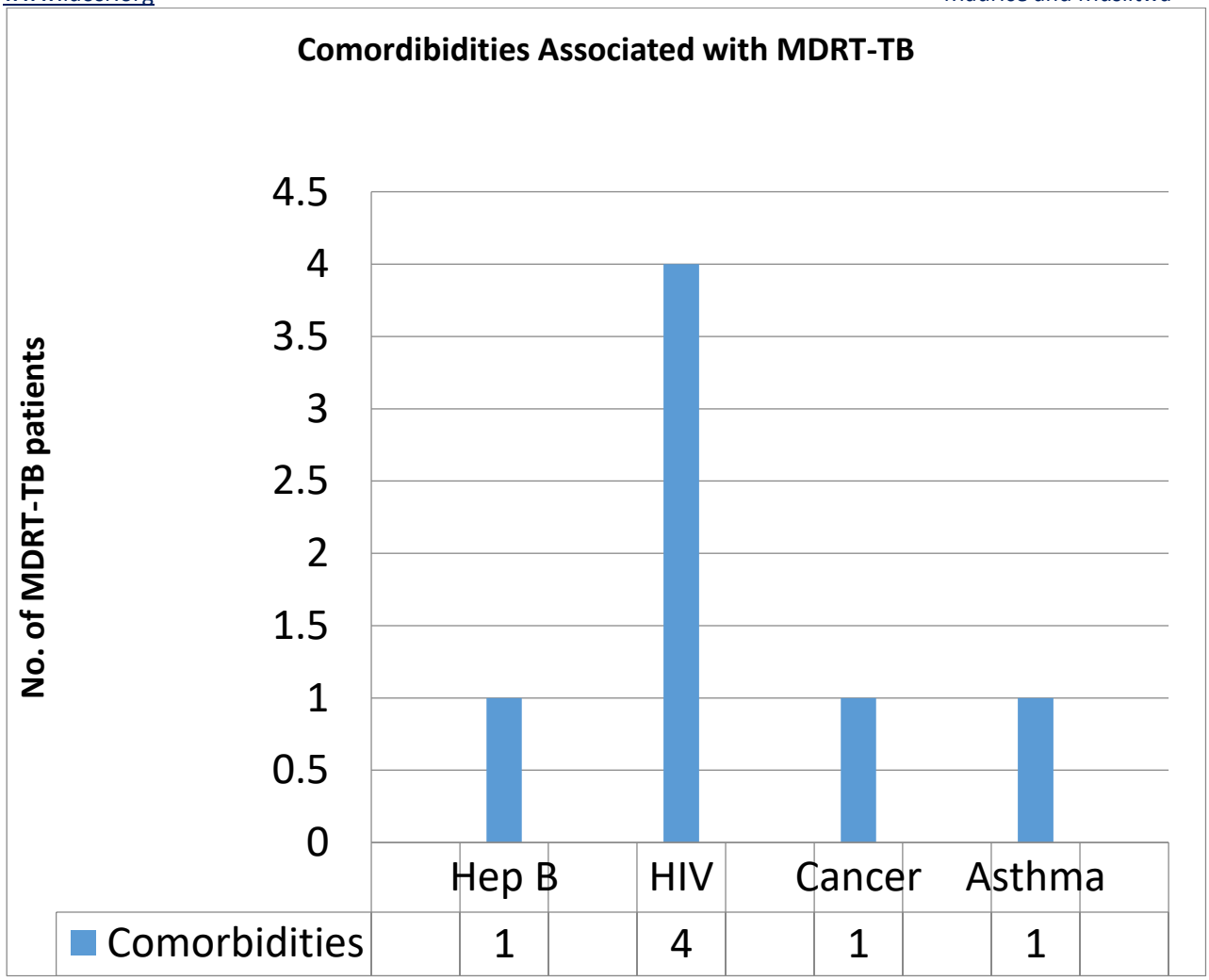

Figure 2: Comorbidities associated with MDR-TB

MDR-TB patients prior Treatment status

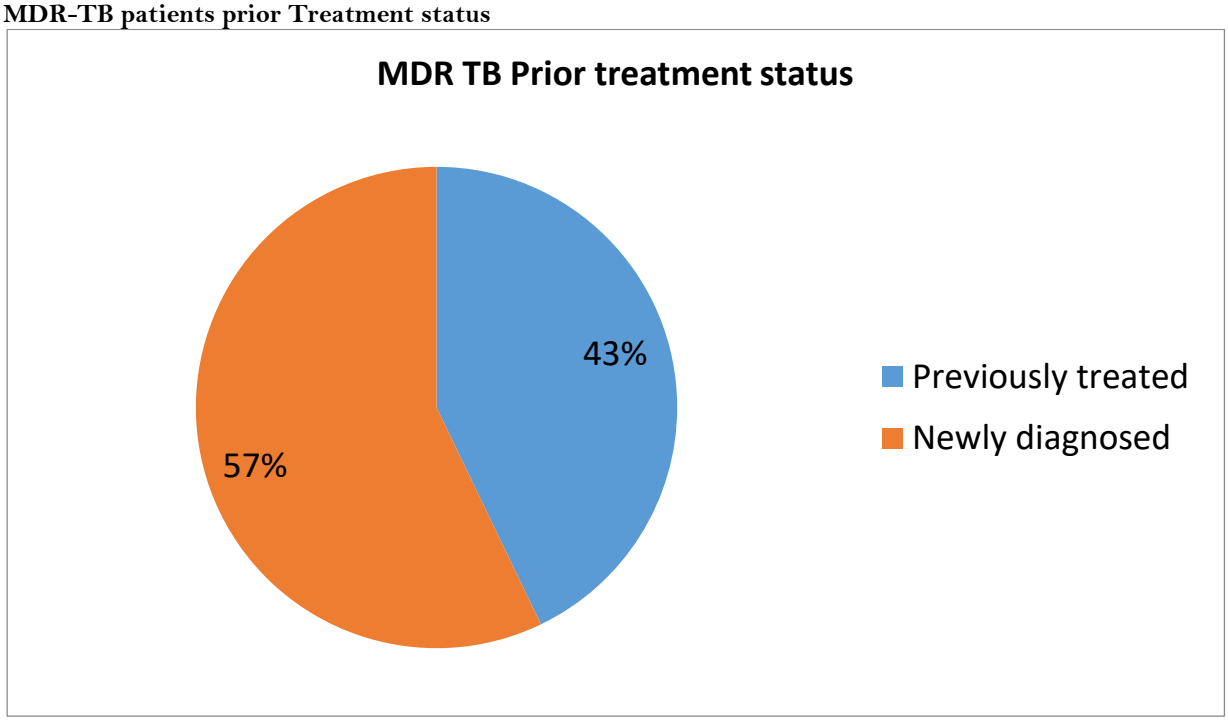

Figure 3: Pie chart showing MDR-TB patient's prior treatment status.

From the above pie chart, a majority of MDR-TB patients were newly diagnosed constituting 57% which signifies existence of a viscous cycle of disease transmission at the community level. Similarly, 43% of the cases had a prior history of being treated for DS-TB implying existence of gaps in either treatment protocols, infection prevention and control (IPC), patients follow up and contact tracing.

Socio-demographic characteristics of the respondents

50 participants participated in the study giving a response rate of 90.9%. Majority of the respondents were males 35 (70%), were Karimojong by tribe 28 (56%) and were aged between 50-56 years 40 (80%). Majority of the respondents had only primary education 11 (82%), were on first line anti-TB regimen 29 (58%) and in initiation phase 33 (66%).

The socio-demographic characteristics of the respondents are summarized in the table below.

Table 1: Socio-demographic characteristics of the respondents

Variable	Frequency (n=50)	Percentage
Respondent's gender		
Male	35	70
Female	15	30
Respondent's tribe		
Karamojong	28	56
Pokot	13	26
Itesot	3	6
Acholi	1	2
Langi	1	2
Others	4	8
Respondent's religion		
Catholic	12	24
Anglican	15	30
Moslem	8	16
Pentecostal	6	12
Others	9	18
District of residence		
Moroto	15	30
Napak	10	20
Nakapiripirit	8	16
Kotido	7	14
Others	10	20
The respondent's Age groups.		
15-25	1	2
30-45	5	10
50-65	40	80
Above 65	4	8
Patient's education status,		
None	7	14
Primary school	41	82
Tertiary institution	2	4
The respondent's treatment Category		
1st line	29	58
2nd line	20	40
Missing	1	2
Respondent's treatment Phase during the time of study		
Intensive	33	66
Continuation	17	34

Socio-demographic factors associated with MDR-TB

From the analysis of the findings, age below 50 years (aOR=14.16, p-value 0.001) was found to be significantly associated with MDR-TB. The socio-demographic factors associated with MDR-TB are summarized in the table 2 and table 3 below.

Table 2: Bivariate analysis of socio-demographic factors associated with MDR-TB

Variable	MDR-TB, n (%)	No MDR-TB, n (%)	OR (95% CI)	p-value
Respondent's gender				
Male	4 (57.1)	31 (72.1)	1.01 (0.64-1.59)	0.253
Female	3 (42.9)	12 (27.9)	1	
Respondent's religion				
Christians	6 (85.7)	27 (62.8)	3.03 (1.23-7.46)	0.567
Non-Christians	1 (14.3)	16 (37.2)	1	
***Age groups**.				
Below 50	5 (71.4)	1 (2.3)	13.9 (8.03-24.13)	0.231
50 years and above	2 (28.6)	42 (97.7)	1	
***Education status**				
None	4 (57.1)	3 (7.0)	1.91 (0.69-1.74)	0.056
Primary school and above	3 (42.9)	40 (93.0)	1	
Treatment Category				
1st line	1 (14.3)	28 (65.1)	1.39 (0.61-3.16)	0.402
2nd line	6 (85.7)	15 (34.9)	1	
Treatment Phase				
Intensive	5 (71.4)	28 (65.1)	0.75(0.78-3.93)	0.267
Continuation	2 (28.6)	15 (34.9)	1	

***Considered for multivariate analysis with a p-value <0.25**

From the bivariate analysis of socio-demographic factors at a confidence interval of 95%, p-value <0.25, age lesser than 50years (aOR=13.9, p-value 0.231) and not being educated (aOR=2, p-value 0.056) were found to be significant and were further considered for multivariable analysis.

Table 3: Multivariate analysis of socio-demographic factors associated with MDR-TB

Variable	aOR (95% CI)	p-value
Respondent's gender		
Male	1.14 (0.78-2.52)	0.067
Female	1	
****Age groups**.		
Below 50	14.16 (7.8-25.4)	0.001
50 years and above	1	
Education status,		
None	3.51 (0.84-2.71)	0.017
Primary school and above	1	

****Considered statistically significant with a p-value <0.05 at 95% Confidence interval.**

From the above factors that were considered for multivariate analysis, it was observed that not being educated (aOR=3.51, p-value 0.017) at confidence interval of 95% was more associated with occurrence of MDR-TB with a threefold increased risk compared to those patients who were educated. Age below 50 years (aOR=14.16, p-value 0.001 at confidence interval of 95%) was as well found be significantly associated with increased chances of developing MDR-TB with a fourteen times increased risk compared to TB patients aged more than 50 year.

Socio-economic factors associated with MDR-TB

The result from the multivariable analysis showed that positive HIV status (aOR =4.39, p-value 0.034)

(CI 95%), history of previous TB treatment (aOR=7.16, p-value 0.001) (CI 95%) and having symptoms for a period of more than 1 year were significantly associated with MDR-TB among patients at SKHM. The bivariate and multivariate results of analysis are shown in table 4 and table 5 below respectively.

Table 4: Bivariate analysis of socio-economic factors associated with MDR-TB

Variable	MDR-TB n (%)	No MDR-TB n (%)	OR (95% CI)	p-value
***HIV status**				
Positive	2 (28.6)	34 (79.1)	7.59 (.477–1.208)	0.245
Negative	5 (71.4)	9 (20.9)	1	
Contact with TB patient				
Yes	2 (28.6)	5 (11.6)	0.6 (0.319 - 1.048)	0.471
No	5 (71.4)	38 (88.4)	1	
History of smoking				
Yes	2 (28.6)	12 (27.9)	1.26 (0.57-2.78)	0.576
No	5 (71.4)	31 (72.1)	1	
Living conditions				
Own home	7 (100.0)	42 (97.7)	2.3 (0.074 - 22.41)	0.863
Others home	0 (0.0)	1 (2.3)	1	
***Alcohol consumption**				
Yes	4 (57.1)	24 (55.8)	0.70 (0.40-1.25)	0.23
No	3 (42.9)	19 (44.2)	1	
***Underlying health conditions**				
Yes	5 (71.4)	28 (65.1)	1.1 (0.147 - 7.699)	0.071
No	2 (28.6)	15 (34.9)	1	
***Previous TB treatment History**				
Yes	3 (42.9)	12 (27.9)	4.26 (2.18-8.12)	0.228
No	4 (57.1)	31 (72.1)	1	
History of missed medication				
Yes	3 (42.9)	12 (27.9)	0.6 (0.048 - 6.266)	0.630
No	4 (57.1)	31 (72.1)	1	
***Knowledge of simple and complicated TB**				
Yes	2 (28.6)	17 (39.5)	0.1 (0.015 – 1.175)	0.070
No	5 (71.4)	26 960.5)	1	
Presence of MDR-TB social support groups				
No	7 (100.0)	40 (93.0)	0.57 (0.30-1.05)	0.07
Yes	0 (0.0)	3 (7.0)	1	
***Duration of signs and symptoms**				
Less than 1 year	3 (42.9)	28 (65.1)	0.3 (0.040 -2.291)	0.247
More than 1 year	4 (57.1)	15 (39.4)	1	

***Considered for multivariate analysis with a p-value <0.25**

From the bivariate table above, at a confident interval of 95% and p-value <0.25, HIV co-infection, alcohol consumption, having underlying health conditions, previous TB treatment history, duration of symptoms lesser than 1 year and having knowledge of TB were found significantly associated with MDR-TB and were therefore considered for multivariate analysis. Th multivariate analysis of the above factors is shown on table 5 below.

Table 5: Multivariate analysis of socioeconomic factors associated with MDR-TB

Variable	OR (95% CI)	p-value
****HIV status**		
Positive	4.39 (1.85-10.4)	0.034
Negative	1	
Alcohol consumption		
Yes	0.9 (0.223- 3.614)	0.879
No	1	
Underlying health conditions		
Yes	1.4 (0.163 – 11.824)	0.764
No	1	
****Previous TB treatment History**		
Yes	7.16 (7.8-25.4)	0.001
No		
Knowledge of simple and complicated TB		
Yes	0.7 (0.229 – 2.116)	0.524
No	1	
****Duration of signs and symptoms**		
Less than 1 year	2.29(0.79-6.69)	0.031
More than 1 year	1	

****Considered statistically significant with a p-value <0.05 at 95% Confidence interval**

From the above multivariate table, it can be deduced that having HIV-TB co-infection showed a four-fold increased risk of developing MDR-TB compared to TB patients without HIV co-infection. (aOR =4.39, p-value 0.034) (CI 95%). Similarly being previously treated for TB(at CI 95%, aOR=7.16, p-value 0.001) and having disease signs and symptoms for a duration lesser than 1 year (aOR =2.29, p-value 0.031) (CI 95%) increases the lifetime risk of developing MDR-TB seven times and twice respectively compared to newly diagnosed TB patients and those with symptoms for more than 1year duration.

Political commitment with adequate, sustained financing

The findings of the study showed that the facility had a well-organized laboratory network, policies and SOPs for MDR-TB case findings and a rapid, reliable and safe system to collect specimens from the patient. However, DST is not routinely performed for first line drugs, there are infection control measures put in place to halt transmission of the infection to other patients and confirmed MDR-TB patients are not started on treatment as soon as possible. The hospital lacked adequate financing of MDR-TB activities. The results are summarized in the table below.

Table 6: Health system related factors associated with MDR-TB

Factor	Yes	No
Laboratory network well organized and functional to provide minimum services necessary to support DOTS and diagnosis of MDR/XDR-TB	✓	
MDR-TB care free of charge in this facility	✓	
Policies and standard operating procedures for MDR-TB case findings available	✓	
Confirmed MDR-TB patients started on treatment as soon as possible		✓
DST routinely performed for first-line drugs at the regional reference laboratory, if appropriate according to national guidelines		✓
While waiting for results, infection control measures are put in place to halt transmission of the infection to other patients		✓
Offer HIV testing, counseling services to possible MDR-TB cases	✓	
Results of MDR-TB patients reported to treatment center as soon as available	✓	
Presence of a rapid, reliable, safe system to collect specimens from the patient and to transport and refer specimens to the appropriate laboratory or to transport the patient to the treatment site	✓	
Household contacts of MDR-TB patients (including children) evaluated to find additional TB cases	✓	
Presence of adequate financing and sustainability of MDR-TB activities in the facility		✓

Standard treatment, with supervision and patient support

From findings of the study, the facility has national treatment guidelines or protocols for MDR/XDR-TB in use and accessible to clinicians.

However, treatment regimens are not consistent with international recommendations, there is no systematic assessment of adherence to TB treatment and the facility has no specific protocols and policies for treatment of failures, relapses or retreatment cases. Also, the facility faces challenges of drug stock outs, lack of 2nd line anti-TB medications and lack of medicines to treat adverse reactions due to anti-TB medicines. The results are summarized in the table below:

Table 7: Health system related factors associated with MDR-TB

Factor	Yes	No
Treatment regimens used (e.g., Category I, II, III) consistent with international recommendations?		✓
Fixed-dose combination (FDC) first-line drugs used for treatment	✓	
Presence of MDR-TB treatment guidelines accessible to clinicians and nurses involved in the care of patients that are consistent with WHO recommendations?	✓	
Adherence assessed systematically through DOT and recording and reporting of observation		✓
Presence of a system to track patients who have not collected their medication		✓
Presence of supportive supervision programs on MDR-TB services at each levels of care		✓
Presence of policies and protocols for the treatment of failures, relapses, and retreatment cases		✓
Presence of incentives or enablers used to support patients in completing treatment	✓	
Drug stock outs of first-line drugs in the last 12 months		✓
Adequate supplies of second-line drugs (for approved treatment regimens) available to treat all MDR-TB cases		✓
Presence of systematic monitoring of MDR/XDR-TB patients for adverse effects		✓
Presence of medicines required for the treatment of TB drugs' adverse events available?		✓
Presence of national treatment guidelines or protocols for MDR/XDR-TB in use?	✓	
Capacity within facilities to provide isolation for MDR/XDR-TB patients while on inpatient treatment		✓
Presence of out reaches or activities committed for vulnerable populations for example prisons specifically designed for MDR-TB diagnosis, reporting and care?		✓

DISCUSSION

Prevalence of MDR-TB

Tuberculosis (TB) remains one of the leading infectious diseases globally, with a high case fatality rate [1]. In Sub-Saharan Africa, multidrug-resistant TB (MDR-TB) has become a significant challenge, impeding progress in TB control efforts [18]. MDR-TB is caused by Mycobacterium tuberculosis strains resistant to at least isoniazid and rifampicin, the two most potent first-line anti-TB drugs [19]. Transmission occurs primarily through airborne droplets from person to person, but it may also develop due to factors such as poor treatment adherence, inappropriate prescriptions, or inadequate TB control measures [18]. In this study, the prevalence of MDR-TB at St. Kizito Hospital Matany (SKHM) was found to be 14%. This prevalence is notably higher than the 1.4% among new TB cases and 12.1% among previously treated TB cases reported in a 2020 study conducted in Uganda [20]. Additionally, this finding exceeds the low levels of MDR/RR-TB prevalence (<3%) reported in many parts of the world, as documented in the 2015 and 2016 WHO Global TB Reports [21]. By contrast, other regions within the WHO African Region have reported relatively higher MDR/RR-TB rates. For instance, MDR/RR-TB prevalence among new and previously treated TB cases in Nigeria, the Democratic Republic of Congo, Ethiopia, South Africa, and Somalia are reported at 4.3% and 25%, 3.2% and 14%, 2.7% and 14%, 3.5% and 7.1%, and 8.7% and 47%, respectively [22]. Nonetheless, this study suggests that the prevalence of MDR-TB in Karamoja sub-region surpasses these figures, highlighting a critical public health challenge. The high prevalence in Karamoja is likely due to multiple factors. Late presentation to health facilities for TB treatment is a major contributor, as delays allow Mycobacterium tuberculosis more time to develop drug resistance. Additional factors include the high HIV burden, inadequate community engagement in contact tracing, poor health-seeking behavior, high levels of alcoholism, and insecurity related to the pastoral lifestyle of the region. Furthermore, a high pill burden, long treatment durations, side effects of

TB drugs, social stigma, and inadequate social support systems contribute to poor adherence and treatment dropout. Other contributing factors include limited public awareness of MDR-TB, lack of testing facilities, and delays in diagnosis, all of which exacerbate the burden of drug-resistant TB in the area.

The study also revealed a strong association between MDR-TB and HIV/AIDS co-infection. This finding aligns with studies conducted in Uganda, Ethiopia, and India, which also reported a high burden of HIV co-infection among MDR-TB patients [23]. HIV-infected individuals are more susceptible to MDR-TB due to factors such as rapid disease progression, reduced drug absorption, early infection reactivation, and exposure to MDR-TB strains in community or healthcare settings. Common risk factors such as intravenous drug use, imprisonment, low socioeconomic status, alcoholism, and frequent hospitalization further compound the issue [24]. TB-HIV co-infection has profound implications for patient outcomes. Co-infected individuals experience accelerated disease progression, significantly reduced survival rates, and lower treatment success rates compared to those with TB or HIV alone [25]. This underscores the need for integrated TB and HIV management to improve health outcomes in co-infected individuals.

Socio-demographic and Socioeconomic Factors Associated with MDR-TB

This study identified several socio-demographic and socioeconomic factors associated with MDR-TB at SKHM. Age below 50 years, HIV-positive status, a history of previous TB treatment, and the presence of TB symptoms for over one year were significantly associated with MDR-TB. Similar findings were reported in a 2021 study conducted in Ethiopia [26]. Patients younger than 50 years were 13.9 times more likely to develop MDR-TB compared to those older than 50 years (aOR=14.16, p=0.001). This is consistent with findings from Eastern Ethiopia [26]. Younger individuals may face challenges such as tight work schedules, long-distance travel for work, and alcohol addiction, all of which contribute to poor adherence to anti-TB treatment. Conversely, studies from Spain and China [27] suggest that individuals older than 50 years are more predisposed to MDR-TB, possibly due to differences in population demographics and healthcare policies. The study also showed that patients with a history of previous TB treatment were seven times more likely to develop MDR-TB than those without such a history. This finding aligns with studies from Namibia [28], Bangladesh, Georgia, China, and Malaysia. Poor adherence to treatment, inappropriate drug use, and improper storage of anti-TB drugs are likely contributors. These factors can lead to genetic mutations in Mycobacterium tuberculosis, resulting in drug resistance. Furthermore, the study found that patients who exhibited TB symptoms for more than one year were at higher risk of MDR-TB. Delayed healthcare-seeking behavior, a common issue in Ugandan communities, contributes significantly to this trend [29]. Reasons for delays include negative attitudes toward Western medicine, reliance on herbal remedies, and long distances to healthcare facilities [30]. These delays not only allow for the development of drug-resistant strains but also facilitate community transmission of MDR-TB.

Healthcare System-Related Factors Associated with MDR-TB

The study revealed that SKHM has a well-organized laboratory network and adheres to standard operating procedures (SOPs) for MDR-TB diagnosis and specimen collection. These measures align with WHO and Ugandan Ministry of Health strategies to improve TB diagnosis and case detection [31]. Early diagnosis and efficient case detection are critical in reducing MDR-TB acquisition and community transmission [32]. However, significant gaps in the healthcare system were identified. Drug susceptibility testing (DST) for first-line drugs is not routinely performed, and there are no infection control measures to prevent the spread of MDR-TB within healthcare settings. Delayed initiation of treatment for MDR-TB patients further exacerbates the problem, increasing the risk of progression to extensively drug-resistant TB (XDR-TB), which is more challenging to manage. Additionally, while the facility has national treatment guidelines for MDR/XDR-TB, treatment regimens are inconsistent with international recommendations. Challenges such as drug stockouts, a lack of second-line anti-TB drugs, and insufficient medications to manage adverse drug reactions hinder effective treatment. These issues reduce treatment success rates and contribute to the spread of MDR-TB in Karamoja. Delay in initiating treatment was identified as the second strongest factor associated with MDR-TB, consistent with findings from a study in China [33]. Addressing these delays through strengthened healthcare systems, increased resources, and community engagement is essential for controlling MDR-TB in the region.

CONCLUSION

The prevalence of MDR-TB at St. Kizito Hospital Maternity was high (17.5%). This is a warning to TB control programme in Karamoja Sub region, Northern Uganda. Age below 50 years, positive HIV status, history of previous TB treatment and late presentation to the hospital were the socio-economic

factors associated with MDR-TB among patients at SKHM. There is insufficiency of medical supplies to help in the fight against MDR-TB in Karamoja Sub region.

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